Internal
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OGMCOAL - Crandall Water Treatment

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Date: 2/9/2010 3:24 PM
Subject: Crandall Water Treatment
CC: OGMCOAL; bmeans@osmre.gov

Hello all:

Yesterday I spoke with Mr. Brent Means, who is OSM's water treatment expert in Pennsylvania. My reasons for contacting Mr. Means were to discuss whether he has experience with situations similar to Crandall Canyon, and to see if he had any recommendations. From our conversation, I've summarized Mr. Means main points of concern:

- Maelstrom oxidizer units can be very effective in producing iron precipitate, however, getting the iron precipitate to settle out can be very difficult.
- The iron precipitate formed as a result of treatment with the Maelstrom unit under conditions like we have at Crandall will be very difficult to settle. This is a result of the extremely fine particle size and the positively-charged particles which result from aeration treatment.
- A typical (minimum) design recommendation to settle the iron precipitate formed by the Maelstrom unit would be a 48-hour retention time, followed by a wetland. From a short-term/immediate view point, we're obviously well below a 48-hour retention time and do not have a polishing wetland. Can the addition of a flocculent compensate for a lack of adequate retention time? From a long-term/reclamation stand-point, this is definitely something that must be considered.
- Mr. Means indicated that wetlands have been more effective at removing positively-charged iron precipitate than pond-type clarifiers, and attempts to pond-clarify should be avoided for treating the relatively low concentrations of iron at Crandall. Again, this is a long-term/reclamation consideration at this point.
- Improved settling by coagulant / flocculant addition has been difficult to achieve; though these chemicals have been successful at some sites.
- Brent highly recommends treatment by addition a 20% solution of sodium hydroxide to raise the pH to 8.5 without oxidation. The resulting ferrous hydroxide precipitate settles more rapidly than the ferric hydroxide precipitate resulting from the Maelstrom unit.
- A complete water chemistry analysis (including typical cations and anions) should be completed ASAP to aid in the design of an effective treatment approach.

These points are good to consider during design of both the temporary and final reclamation treatment systems at Crandall. I would like to see the complete water chemistry analysis completed next time JBR is at the site collecting samples. I can provide a list of parameters.

Please feel free to contact me if you have any questions. I look forward to our call tomorrow.

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